



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

:

*Michael W. Eknoian*

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Examiner: Wu, Ives J.

U.S. Serial No. 10/761,682

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Group Art Unit: 1713

Filed: January 21, 2004

Docket No. 1872DIV.VIN (EM-05-20)

For: SALT SENSITIVE AQUEOUS  
EMULSIONS

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Mail Stop Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

DECLARATION UNDER 37 CFR 1.132

Rajeev Farwaha hereby declares:

1. That he was awarded a PhD degree in organic chemistry from the University of Western Ontario and has worked in the field of polymer technology for 21 years, and that he has worked in the field of polymers for 18 years.
2. That he understands from Counsel that the claims in the above referenced patent application have been rejected over United States Patent No. 6,423,804 to *Chang et al.*, and that he is familiar with the pending application and with the *Chang et al.*

reference which forms the basis for the rejections made in the Official Action over prior art.

3. That the *Chang et al.* reference describes nonwoven webs with *solution* polymerized binders, which are made by modifying conventional solution polymers to include sulfonated monomer groups. The present invention, on the other hand, is directed to salt-sensitive *aqueous emulsion* binders which disperse in water, but remain non-dispersible in salt solutions; an invention which is substantially different from, and not, in his opinion, even remotely suggested by *Chang et al.*
4. That the *Chang et al.* patent states in col. 4:  

carboxylic acid, amide, and sulfoamide groups. Other suitable hydrophilic and hydrophobic monomers include the vinyl monomers disclosed in U.S. Pat. No. 5,317,063, assigned to Lion Corporation, Tokyo, Japan, which is herein incorporated by reference in its entirety.

That the polymers disclosed in the examples of the *Chang et al.* patent are AMPS-modified polymers of the above referenced Lion Corporation polymers which may be prepared according to either US 5,317,063 or US 5,312,883. That both of the '063 and '883 Lion patents employ solution polymers, and do not teach the use of emulsion polymers.

5. Examples from each of the '063 and '883 Lion patents are reproduced below. As can be seen, the representative examples use a solution polymerization process where the monomers are polymerized in the presence of an organic solvent medium.

5,317,063

#### EXAMPLE 1

To a 500 ml four-necked separable flask provided with a stirring machine, a reflux condenser and a tube for introducing nitrogen gas, there were added 80 g of acrylic acid, 20 g of benzyl acrylate, 150 g of acetone and 35 g of deionized water for forming a uniform solution and then nitrogen gas was introduced into the flask through the nitrogen gas-introducing tube with stirring. After 20 minutes, there was added, to the solution, a solution of a polymerization initiator obtained by dissolving 0.1 g of 2,2'-azobis(2-amidinopropane) dihydrochloride in 5 g of deionized water to initiate the polymerization reaction in a water bath maintained at 70° C. The system was polymerized at 70° C. for 6 hours in a nitrogen gas stream, then cooled to room temperature and neutralized by adding a mixed solution comprising 4.6 g of a 48% aqueous solution of sodium hydroxide (rate of neutralization=5 mole % with respect to the acrylic acid), 60 g of deionized water and 240 g of ethanol. The solid content of the resulting polymer solution as determined by a Kett moisture meter was found to be 16.1% and the polymer had a weight-average molecular weight of 370,000.

About 3 g of this polymer solution was poured into a region which was defined by enclosing a part of the surface of a polyethylene plate placed on a horizontal base with silicone rubber and which had a size of 10 cm square, allowed to stand under constant temperature and humidity conditions of 25° C. and 50% RH for 2 days to form a film. The thickness of the resulting film varied depending on every portions to be determined, but fell within the range of from 35 to 50  $\mu$ m.

5,312,883

#### EXAMPLE 1

55 g of acrylic acid, 15 g of 2-ethylhexyl acrylate, 30 g of butyl acrylate, 106 g of acetone and 38 g of distilled water were fed in a 500 ml four-necked separable flask provided with a stirrer, reflux condenser and nitrogen-introducing tube to obtain a homogeneous solution. Then nitrogen gas was introduced into the flask through the nitrogen-introducing tube under stirring. 20 minutes after, a solution of a polymerization initiator prepared by dissolving 0.88 g of 2,2'-azobis(2-amidinopropane) dihydrochloride in 5 g of distilled water was added to the resultant solution to initiate the polymerization reaction under heating in a water bath maintained at 70° C. After conducting the polymerization at 70° C. for 6 hours in nitrogen gas stream, the reaction mixture was cooled to room temperature and then neutralized by addition of 7.65 g of 48 wt. % aqueous sodium hydroxide solution and 380 g of distilled water (neutralization rate: 12 molar % based on acrylic acid; weight-average molecular weight: 300,000). The solids content of the resultant polymer solution as determined with a Kett moisture meter was found to be 15.5%.

6. That, in contrast to the polymers used in the Chang et al. and the Lion patents, the binders employed in connection with the present invention are emulsion polymerized latexes which are emulsion polymerized in an aqueous medium in the presence of surfactants and/or protective colloids. That the invention provides salt-sensitive emulsion resins that are useful, for example, as a binder on nonwoven webs. That, in his opinion, the *Chang et al.* reference is not suggestive of the emulsion binders of the invention because *Chang et al.* teaches to use monomers that are extremely soluble in water, such as acrylic acid, which are polymerized in an organic solvent medium.
7. That the salt-sensitive properties achieved by the emulsion resins are unexpected because the emulsion polymers used are usually at least somewhat insoluble in

water, yet can be produced in a way such that films (or the like) formed from the emulsion readily disperse in water, without the resin completely dissolving. For example, the emulsion polymers disclosed in the examples of the present invention comprise monomers such as methacrylic acid, ethylhexyl acrylate, and butyl acrylate; polymers containing monomers such as vinyl acetate and monooctyl maleate are also disclosed. These emulsion polymers are relatively insoluble in water, yet are made to be dispersible in tap water and non-dispersible in salt solutions, as is seen in the table in the pending application at p. 59. This behavior is surprising as one of skill in the art would not expect that resins which are insoluble enough to exist as stable emulsions, would form films which are readily dispersible in water.

8. That the emulsion polymers of the present invention do not exhibit significant sensitivity to hard water ions, such as divalent cations, and indeed generally remain dispersible in hard water without the need for hard water-inhibiting monomers. This is also surprising because conventional salt-sensitive resins, such as the solution polymers described in *Chang et al.* require the inclusion of divalent ion inhibiting ingredients such as AMPS co-monomers, in order to maintain acceptable solubility in hard water. Reference is made to col. 3 in *Chang et al.*

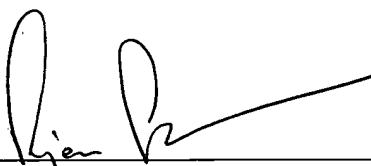
Unlike the Lion polymers and other polymers cited in technical literature, the polymers of the present invention are ion triggerable, as well as, soluble in water having from greater than about 15 ppm  $\text{Ca}^{2+}$  and/or  $\text{Mg}^{2+}$  to about 200 ppm  $\text{Ca}^{2+}$  and/or  $\text{Mg}^{2+}$ . The polymers of the present invention have been formulated to minimize the potentially strong interaction between the anions of the polymers and the cations in the water. This strong interaction can be explained

9. The use of emulsions is advantageous from a processing and shipping perspective as compared to the solution polymers of the prior art. Emulsions can be conveniently made at high solids contents and low viscosity; thus, they are much cheaper to ship than solution polymers. Another advantage is that emulsions are generally more stable than polymer solutions which are homogenous, one-phase mixtures, where all the components are blended within one another at the molecular level and which

generally tend to separate over time, even under ideal conditions. Additionally, emulsions are preferred from an environmental perspective because, unlike solution polymers, they do not employ significant quantities of organic solvents.

10. The undersigned Declarant declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the subject application or any patent issuing thereon.

Dated 07/06/2006

  
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Rajeev Farwaha